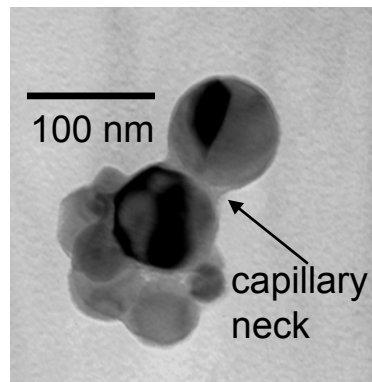


Porous Materials from Nanoparticle Agglomerates

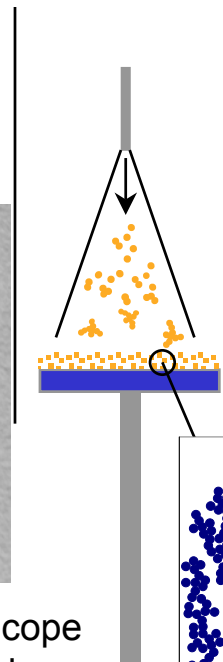
Sheryl H. Ehrman, University of Maryland, DMR - 0093649



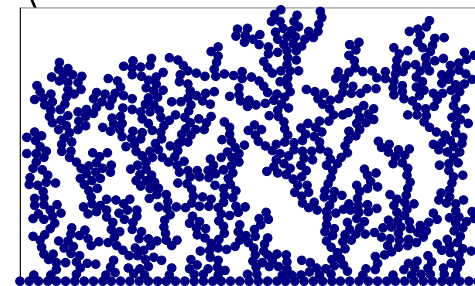
- Nanoparticle agglomerates have many current and potential applications including photovoltaic materials, sensors, and catalytic materials. We are focusing our efforts on two tasks: exploring the formation of porous titania films from nanoparticle agglomerates, and on developing a process based on low temperature capillary condensation to interconnect the porous films for increased strength with minimal loss of surface area.
- We are developing models to describe both the microstructure of the nanoporous deposit, and to describe the deposition uniformity, as a function of reactor operating variables.
- Experiments to interconnect nanoparticles in a controlled fashion are underway. We are comparing our experimental results to behavior expected based upon known theories of capillary condensation.



Transmission electron microscope showing capillary neck formed between titania nanoparticles by controlled condensation



Schematic of high temperature particle synthesis reactor showing deposition onto chilled substrate.



Monte Carlo simulation of film growth by particle deposition

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Education: Four undergraduate students, Vikansha Dwivedi, Niloo Ghaemi, Sarah Reckentall-Work, and Jason Repac, and three graduate students, Teddy Damour, Seonmin Kim and Tosin Ogunsola contributed to this work. Three of the students (V. Dwivedi, N. Ghaemi and S. Reckentall-Work) were supported through a summer program, Research Internships in Science and Engineering (RISE), intended to increase interest among women in science, technology, engineering and math (STEM) careers, also sponsored by NSF (HRD-0120786).

Outreach: In May 2003, Teddy Damour and Tosin Ogunsola and the PI participated in Bell Multicultural High School's Career Day, to increase interest in careers in science and engineering. In July of 2003, the summer program students and the PI developed an interactive workshop for incoming freshman women majoring in STEM in which they built and tested photovoltaic cells using titania nanoparticles.



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